

Six Years' Notes on Migrant Lepidoptera on and near the Coast of N.W. France

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I resided from early 1969 to early 1975 at Le Havre (Seine Maritime), on the northern tip of the Seine estuary. Despite holidays elsewhere in some years (detailed later), I was able to collect and observe Lepidoptera during six successive summers, and indeed whole years; while excluding from this article the results of the more distant holiday-trips, I include the observations made on two or three visits, none longer than a fortnight, to more western points on the coasts of Normandy and Brittany. I entered regularly in my customary diary all my captures and observations; these gave the names, not only of species taken, but of those seen and not captured, when the identities were sure; also the exact numbers, or if numerous some indication thereof; the weather conditions were also noted.

The dividing line between migrants and non-migrants is not sharp. The total number of Lepidoptera species which I captured in the Le Havre district was about 600. Among these many entries, comparatively few were of explicit observations of migratory movements or swarms; yet many were of recognised or suspected migrants. I have decided to include these in this article and to comment on the records of each separately in the light of the observed or supposed migration of each. The main lists of migrants which I have consulted for this purpose are: (A) G. F. Cockbill and M. E. Gibbs in C. B. Williams and others (1942): 105-142; and (B) U. Eitschberger and H. Steiniger (1973): 145. The former deals with the British Isles, the latter with Central Europe. As N.W. France is closer to the British Isles, I have felt justified in trying to steer a middle course between the two. I have included some species of whose migration the earlier work furnished strong evidence even though omitted in the later list. There is, of course, a general agreement between the two systems; but the lists and groupings are not identical.

The 31 selected species are as in the following list, and the accompanying Table summarises the records synoptically.

RHOPALOCERA

Papilio machaon (L.) *bigeneratus* Verity; *Colias croceus* Geoff.; *Gonepteryx rhamni* (L.); *Pieris brassicae* (L.); *P. rapae* (L.); *P. napi* (L.); *Cyaniris semiargus* (Rott.); *Vanessa atalanta* (L.); *Cynthia cardui* (L.); *Aglais urticae* (L.).

HETEROCERA

Ostrinia nubilalis (Hübner.); *Udea ferrugalis* (Hübner.); *Nomophila noctuella* (Den. & Schiff.); *Orphananema obstipata* (Fabr.); *Macroglossum stellatarum* (L.); *Euproctis chrysorrhoea* (L.); *Euproctis similis* (Fuessly); *Leucoma salicis* (L.); *Arc-*

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SYNOPTIC TABLE OF MIGRANTS IN N.-W. FRANCE SEEN OVER SIX YEARS

Number of records in year of each species is shown at end of each year.

- = 1-5 individuals seen on each observation
 ○ = 6-10 ditto
 ● = 11- innumerable ditto
 * = see note in text under "individual species"
 L = larva observed
 H = adult hatched from captive pupa.

YEAR	69	70	71	72	73	74
MONTH	3 4 5 6 7 8 9 10 11	3 4 5 6 7 8 9 10 11	3 4 5 6 7 8 9 10 11	3 4 5 6 7 8 9 10 11	3 4 5 6 7 8 9 10 11	3 4 5 6 7 8 9 10 11
RHOFALO						
P.mac		□	□	□	○	□
C.cro	□	□	□	□	□	□
G.rha	□	□	□	□	□	□
P.bra	□	□	□	□	□	□
rap	□	□	□	□	□	□
nap	□	□	□	□	□	□
C.sem	□	□	□	□	□	□
V.ata	□	□	□	□	□	□
C.car	□	□	□	□	□	□
A.urt	□	□	□	□	□	□
METAROC						
O.nub	□	□	□	□	□	□
U.fer	□	□	□	□	□	□
N.noc	□	□	□	□	□	□
O.obs	□	□	□	□	□	□
M.ste	□	□	□	□	□	□
E.chr	□	□	□	□	□	□
sim	□	□	□	□	□	□
L.sal	□	□	□	□	□	□
A.l-n	□	□	□	□	□	□
A.seg	□	□	□	□	□	□
ips	□	□	□	□	□	□
N.pro	□	□	□	□	□	□
P.sau	□	□	□	□	□	□
X.c-n	□	□	□	□	□	□
M.alb	□	□	□	□	□	□
l-a	□	□	□	□	□	□
uni	□	□	□	□	□	□
P.met	□	□	□	□	□	□
A.mon	□	□	□	□	□	□
H.amb	□	□	□	□	□	□
A.gam	□	□	□	□	□	□

tornis l-nigrum (Müll.); *Agrotis segetum* (Den. & Schiff.); *A. ipsilon* (L.); *Noctua pronuba* (L.); *Peridroma saucia* (Hübner); *Xestia c-nigrum* (L.); *Mythimna l-album* (L.); *M. albipuncta* (Den. & Schiff.); *M. unipuncta* (Haw.); *Apamea monoglypha* (Hufn.); *Phlogophora meticulosa* (L.); *Hoplodrina ambigua* (Den. & Schiff.); *Autographa gamma* (L.).

The problems in N.W. France are two-fold: what degree of dependence on immigration from further south (or other directions) is there in each of the recorded species; and what role does the district play in immigrations to the British Isles? The answer to the former question often depends on an answer to another query, not always easily answered, namely

whether a species regularly over-winters in the district. Doubtless an elaborate marking and release campaign would be required for the second question, which incidentally asks whether the district is ever a departure bridge-head for those migrants, whose arrival bridge-heads on the south coast of England are well-known. If William the Conqueror in 1066 sailed from Normandy to Hastings, might not the migrant lepidoptera have had a similar starting-point in their aerial invasion so often landing at Dungeness, near Hastings?

Past records of Lepidoptera movements on the coasts of Normandy or Brittany, if they exist, might supplement my own, but except for a few short reports, dealing, as far as Lepidoptera are concerned, mainly with movements in different directions on the beaches of Deauville by Pieridae in August (C. Lane, 1955, 1957; M. Rothschild, 1963, 1971) I have found none, certainly nothing comparable to the exhaustive summary of C. B. Williams *et al.* (1942) regarding arrivals in the British Isle. I therefore hope that my own records will help to show what actually happens in N.W. France and that where they fail to do so they will perhaps inspire others to continue studying these problems there and elsewhere.

After the individual notes, which endeavour to deduce the local status from the known life-history and the local observation of each species, some more general remarks and conclusions will be attempted.

NOTES ON INDIVIDUAL SPECIES

Under each, as far as possible, will be considered (1) its phenology, (2) the hibernating stage, (3) whether regular in the district or further west in N.W. France, (4) numbers seen, and behaviour if remarkable, (5) whether larvae were found, and (6) local status, and/or origin.

RHOPALOCERA

Except where otherwise indicated, these were diurnal records, usually in sunlight.

P. machaon bigeneratus. As the subspecific name would indicate, the French form is usually two-brooded; but potentially the species is tri-voltine, possibly multivoltine. The pupa hibernates, but may also aestivate in its hottest habitats. It was seen in one year only (for the 1973 record refers to the Mts. d'Arrée, in Brittany, where *machaon* is better established; at any rate, J. Chérel 1967: 33, discussing 50 years' collecting in Brittany, said the species is infrequent in Finisterre but fairly common in other parts of Brittany). The one example seen near Le Havre was probably the ♀ which laid the egg from which the larva, found later on fennel at the same spot, hatched. French colleagues reported that 1970 was "a good year" for *P. machaon* which was appearing outside its usual area; its good years, however, do not correspond with the "good years" for migrants. It must be categorised as an occasional immigrant which fails to establish itself.

C. croceus. Multivoltine. Hibernating stage, not known. Very infrequently seen but when seen, in larger numbers than the preceding. Larva not seen. An occasional immigrant which fails to establish itself in the district.

G. rhamni. Univoltine. Hibernates as an adult. Seen every year, appears stable, seldom numerous. Larva not seen. Usually in woods, but occasionally on more open ground. Was not included by Williams (1942) among migratory species, but recent works (Larsen 1975: 67; Zucchi 1975: 9) show that it may perform local migrations in July. In this district, a stable resident, possibly migrating a little in good years.

P. brassicae. Bivoltine or multivoltine, with pupal hibernation. Seen every year, but later than the two congeners which follow. Does this indicate that it cannot survive the local winter? Probably is more numerous in suitable weather than indicated, as I did not always attempt to distinguish the species when "whites" were seen flying across open country. Probably a resident, and marginal immigrant.

P. rapae. Bivoltine or multivoltine, with pupal hibernation. Was noted every year early in the year. Repeatedly appears in large numbers where there would appear to be insufficient pabulum. On the top and also the lower slopes of Cap la Hève it was observed in large numbers at the same time as very large numbers of the lady-bird *Coccinella 7-punctata* (L.) in 1971; the previous year, at same season but further west in the Bay of the Seine, a similar observation was made (M. Rothschild 1971). Both species have been similarly observed in S. England but no attempt to correlate the phenomenon seems to have been made. During six years I never searched vegetable gardens, hence the lack of records of the early stages. A resident migrant.

P. napi. Bivoltine or multivoltine with pupal hibernation. Seen every year and, except for 1973 when I was away in May, early in the year. Usually in woods or rough country, very steady in numbers and regular throughout the year. The larva was not seen. Was mentioned in C. B. Williams *et al.* (1942) without obvious evidence of migration. Bretherton (1966: 16) said of this species: "not usually migratory and developing definable subspecies". My own observations here would confirm this, and Larsen 1975 considered it non-migratory in the Lebanon. It is only listed here because it is often included in lists and studies of European migrants. A resident, seldom migratory, if at all, here.

C. semiargus. Bivoltine, with pupal hibernation. Was not seen every year; but it is localised, and I did not discover its habitats in my first two years, and in the last did not revisit them. The larva was not seen. In some years singletons only were seen, in others moderate numbers only. No tendency to migrate could be noted, and it is not regarded as a migrant by Eitschberger and Steiniger 1973. It is included here because its status and possible migration into England has been discussed by authors. A resident, not very firmly established in

the Le Havre district, possibly with a slight wandering tendency.

V. atalanta. Univoltine, or bivoltine; the over-wintering stage is the adult, but it is questionable whether the term "hibernation" can be applied to it (see B. J. Lempke 1971). Noted every year in fair numbers. Although its phenology, with long adult stage, is similar to that of *G. rhamni* (above) it always appears somewhat later in the year; this might be argued to indicate an inability to over-winter locally; the winters at Le Havre are not severe, but damp, prolonged, and capricious; in view of the observation by W. Fassnidge (1938: 61) of the larva as common on the Cote d'Azur in April, the May butterflies at Le Havre may well have immigrated from the South of France. In S. Europe where its hibernation has been observed (e.g. Italy, see Verity, 1950: 338) usually the same individual, hatching in mid-summer, both aestivates and hibernates but a small number mature sexually precociously and produce a second autumnal brood, from which the larvae seen in early spring are probably derived. But all this is far from clear-cut and more studies are required over a wide area. In our district it is probably a regular immigrant unable to survive winters. In one year only, 1969, was a clear migration observed: several of this species together with *C. croceus* were seen flying across fields between Le Havre and Etretat on October 25th-27th, and the last examples of these two species were noted on November 1st; having crossed the Seine estuary from south-west to north-east, they crossed the harbour jetty at right angles and continued over the sea towards Cap de la Hève. This same headland seems to act as a loadstone to migratory insects, as already noted under *rapae*.

Cynthia cardui. Potentially multivoltine. Whether any stage is particularly the hibernating one is not clear, as it cannot survive severe winters, but probably if there is one, it is the adult. At Le Havre it failed to appear at all in three of the six years. It was abundant in the late summer of 1969 and one example came to light on 8th August, 1969, together with more numerous examples of the Noctuidae *N. pronuba* and *A. gamma*, listed below. Larvae were not noted. It must be categorised as an occasional immigrant unable to establish itself locally. Its real headquarters are the fringes and oases of the Saharan-Sindian desert. (See my 1946 article and also my book, 1957: 31. In this connection, a query in the 1946 article can now be deleted: would contemporary readers kindly substitute the letter "a" for the sign "?" in cols. VII and VIII of Table 1 in the line starting "DO" (=desert oases); as I said in my book, "in the plains the butterfly disappears after early summer except for a few individuals which persist in oases of the plains throughout summer".)

A. urticae. Bivoltine, hibernating as an adult. Noted every year, seen early in the year in every year save one. A resident migrant.

HETEROCERA

With one exception, *M. stellatarum*, which was only seen in sunlight by day, and, of course, *A. gamma*, which is both diurnal and nocturnal in flight, the following records were all nocturnal or crepuscular, and most were of moths attracted to light, a few being attracted to sugar or flowers.

O. nubilalis. Bivoltine or multivoltine. Hibernates as a larva in stems of its foodplant, but has difficulty in surviving winters in N.W. Europe. Only seen in two years, and late in the summer. Not numerous; larvae not seen. An occasional immigrant, probably unable to survive winters.

U. ferrugalis. Multivoltine, hibernating stage unknown. Only seen in one year, but then in several examples coming to light in October on the coast north of Le Havre, presumably immigrants. Larvae not seen though in some years they are found all over the British Isles. An immigrant, unable to survive winters.

N. noctuella. Multivoltine, the pupa hibernating. Only seen in one year and one example. Larvae not seen. An occasional immigrant, unable to survive winters.

O. obstipata. Potentially multivoltine, probably only bivoltine in France and the British Isles. Only seen in one year and one example. Larvae not seen. An occasional immigrant, unable to survive winters.

M. stellatarum. Not noticed at all in the Le Havre district; the two examples, seen in June 1974, were recorded on the west coast of the Cotentin peninsula (facing Jersey). (?)Bivoltine. Hibernates as an adult, but restlessly, often indoors in subtropical climates. An occasional immigrant, not overwintering locally, apparently more frequently to be found further west than the Le Havre district.

GENERAL REMARKS ON LYMANTRIIDAE SPECIES. Of the four Lymantriid species which now follow, all except *A. l-nigrum*, are listed by Williams *et al.* (1942) but none by Eitschberger and Steiniger (1973). The earlier work gives evidence of swarms immigrating into the British Isles of the first three; as for *A. l-nigrum*, its occasional captures in England must be due to immigration, as it does not reside there. Despite their affinity, similar phenology, and similar habitus, the four Lymantriid species are very different in status.

E. chrysorrhaea (= *phaeorrhaea*) ("The Brown-tail"). Univoltine, the larva hibernating gregariously. Its main breeding places are rather degraded terrain. The absence of records of adults in some years is due to not looking for them, not to their disappearance. Its larvae were seen to survive winters without difficulty in repeated years; it must therefore be considered a resident. Migratory tendencies were not observed.

E. similis ("The Gold-tail"). Univoltine, the larva hibernating gregariously. Its main habitat is woodland. Larvae were observed at least once. No migratory tendency was noted. A resident.

Leucoma salicis ("The White Satin"). Univoltine, the larva hibernating. Its main habitats are poplar avenues or plantations. Though not captured every year it is doubtless a resident. No tendency to migrate was noted.

Arctornis l-nigrum. Univoltine, the larva hibernating. Though found in many parts of France it is everywhere scarce and unpredictable. Does it migrate or is it just a secretive resident? Possibly at Le Havre it is a marginal immigrant.

FAMILY: NOCTUIDAE. The twelve listed members of this family have different types of behaviour and probable origin.

A. segetum. Univoltine, hibernating as a larva. The larva was not observed. In 1969, the best year for other migrants, the moth was not even observed, and in no year was it common. Nevertheless, it is presumed to be a resident. No migratory tendency was observed.

A. ipsilon. Multivoltine. Which stage can diapause is uncertain. Only seen in three of the six years, but common in 1970, which British observers considered a "poor year for migrants". An occasional immigrant unable to establish itself.

N. pronuba. Univoltine, hibernating as a larva, in some years quite common. The larva was not observed. A resident migrant.

P. saucia. Multivoltine. What stage it hibernates is uncertain; indeed whether it can survive cold winters or is capable of diapause in any stage is unclear. Seen in two years only, each time a singleton in September. An occasional immigrant.

X. c-nigrum. Partially bivoltine. Usually the larva hibernates but in some years some individuals pupate, and these pupae produce an earlier brood of the adult. However, larvae were not observed in the district. The moth was noted every year. Certainly a resident, perhaps also migrating.

M. albipuncta. Potentially multivoltine. The larva is the hibernating stage in N. Europe, but probably severe winters kill it off. It was not seen locally. The moth was not noted every year. In view of its migratory reputation, probably a marginal immigrant.

M. l-album. Potentially multivoltine. The larva is the hibernating stage in N. Europe, but is probably killed off by severe winters. It was not noted, but the moth was seen in four of the six years. Probably a resident, but perhaps only a marginal immigrant.

M. unipuncta. Multivoltine. Whether any stage can diapause is uncertain. Appeared in one year: one autumnal individual, doubtless an immigrant. Occasional immigrant.

P. meticulosa. Bivoltine, the autumnal brood usually common. Noted every year. In one year, larvae, evidently of different broods, were observed. The larval stage hibernates. A migrant resident.

A. monoglypha. Univoltine, the larva hibernating. Larva not observed and moth not noted every year, yet the species is doubtless resident; no migratory tendencies were observed; it is not in the list of Eitschberger & Steiniger (1973) but the

records from lightships around the British Isles (C. B. Williams *et al.*, 1942) have shown it immigrates.

Hoplodrina ambigua. Probably bivoltine, the larva hibernating. Was not noted every year, and the first brood in some years was not noted. Indications are that it depends on immigration to maintain its footing in the district. A marginal immigrant.

A. gamma. Multivoltine. Whether any stage can diapause is uncertain. Has been seen every year, in some years in May; often very common later in the year. A regular immigrant.

General Remarks

CLIMATE OF THE LE HAVRE DISTRICT. Being slightly south of lat. 49.50 N., Le Havre lies about half a degree further south than the extreme southernmost point of the British Isles, excluding the Channel Isles. It is about 75 miles (120 km.) due south of Newhaven, or 95 miles (or 150 km.) S.E. of the south tip of the Isle of Wight. It is at the half-way point between the mild west and the colder north-east shores of Northern France. The mouth of the Seine separates it from Honfleur and the beaches of Deauville and the D-day beaches, which are all visible in clear weather; but it actually faces south with its back against the chalk plateau of the Pays de Caux, whose average height is about 100 m. (300 ft.) and slightly protects it from the cold northerly and easterly winds. Its slopes thus have a favourable aspect, and, before urbanisation, were probably, compared with neighbouring localities, an exceptionally favoured natural habitat. However, it is exposed to the frequent southerly and westerly gales; the weather is changeable and windy, and, of course, damp. In six years I saw snow lie there only once, and then for only a day or two (December 31st, 1970). The mean annual precipitation in the area is about 1,000 mm., and the mean annual temperature about 10°C. Most Frenchmen consider its climate bad, but the records show that it has more sunshine than Rouen and other cities of Normandy.

COMPARISONS WITH THE BRITISH ISLES. Were these six years favourable or unfavourable for migrants; and were they meteorologically exceptional? Detailed statistics would be out of place here. A span of six years should be enough to make up for gaps due to absence or shortcomings of technique, and to give a reliable impression of the fauna's reaction to the climate and the annual meteorological variations. If the years were peculiar one would expect the meteorological divagations affecting phenology of lepidoptera to be roughly similar in England and N. France; C. G. M. de Worms in his well-known annual summaries of the season in England (1970, 1971, 1972, 1973, 1974 and 1975) may be abridged and perhaps oversimplified as follows: Years, good for migrants: 1969, 1973. Years, bad for migrants: 1970, 1971, 1972, 1974. The six years were thus predominantly unfavourable in the British Isles, and doubtless also in N.W. France. This surely suffices to explain the poor showing in my table of many well-known

migrant species. However, comparing the details, it is evident that many well-known migrants were not once recorded by me during the whole six years though noted in smaller or greater numbers in the British Isles; but one or two species of well-known migrants coincided in both countries in their appearances. Some discrepancies seem easier to explain than others, e.g. the East Coast immigrants from Scandinavia such as *V. antiopa* and *C. fraxini*, and the American immigrants, usually most frequent in the extreme south-west of the British Isles, such as *D. plexippus* L. and *V. virginienensis* Drury, would find more accessible landing-points than the Le Havre district. Perhaps the huge migration to the British Isles in 1973 of *H. gallii* Rott., which started in Holland, can be similarly explained as that of an East Coast migrant. But there are many other well-known migrants, such as *A. atropos* (L.), *Agrius convolvuli* (L.), *Rhodometra sacraria* (L.) and *M. vitellina* (Hüb.) whose failure to show up in six years at Le Havre is less easy to explain; possible the high currents of wind which are believed to bring these migrating masses from their southerly points of origin tend to reach the South-west or South-east of the British Isles and entirely to miss the Seine estuary area? Or is it that one cannot usefully compare the two lots of records because a single worker in a limited district is not comparable to the team of recorders over the whole British Isles whom C. G. M. de Worms summarised? There are of course species where there is no discrepancy: here the principal names are *C. croceus* and *A. gamma*; and, if less closely corresponding, *A. atalanta* and *V. cardui*.

My own entomological activities were not primarily directed to observing migrants; their purpose was rather to form a local collection (now in the Natural History Museum, Le Havre) and to publish a local list (achieved in E. P. Wiltshire 1974, 1975). Observations of migrants were incidental to these work programmes. My absences from the district on long holiday trips were as follows: 1969: September 6th-27th (England). 1970: June 13th-July 16th (Pyrenees). 1971: June 12th-July 9th (W. Alps). 1972: June 20th-July 10th (Norway). 1973: May 13th-26th (Crete); June 22nd-July 7th (Savoy Alps). 1974: July 8th-August 4th (England).

These absences were not made in the months when migrants were commonest in the British Isles and my presence in the district in these months in some years to a great extent rectifies the failure to record, apart from possible unusual conditions.

I feel therefore that there must be some significance in the discrepancies and the coincidences, and that tentative conclusions are permissible based on the comparison of my records with those made in the British Isles.

Conclusion

As many species have been categorised tentatively above, space need not be wasted here on comparing these groups (residents, marginal immigrants, regular immigrants, occasional

immigrants, resident migrants) with published systems and categories. Infrequently appearing species, such as *P. machaon* and *M. unipuncta* may be very dissimilar, in geographical status, phenology, and migratory capacity. Infrequency, furthermore, may denote unfavourable conditions affecting different parts of the world.

The district of Le Havre has a number of well established residents, some of which have been observed in swarms suggesting migration (e.g. *P. rapae*) while others have only been reported to migrate elsewhere (e.g. *G. rhamni*, *P. napi*, *A. chrysorrhoea*, *E. similis*, *L. salicis*, *X. c-nigrum*, *P. meticulo-losa*), both groups may supply migrants to Britain in "good years", though this has not been demonstrated. Others, less well established at Le Havre, may have supplied immigrants in the past but now be in a state of decline (*C. semiargus*); in this category one might perhaps place *P. crataegi* (L.), extinct now in Britain and Le Havre, though last reported from the former in 1922 and the latter about 30 years ago.

The district appears to be often missed by long-range immigrants from the sub-Tropics or Tropics (e.g. *V. cardui*, *M. stellatarum*, *A. atropos*, *N. noctuella*) but is crossed almost annually from nearer sources by immigrants such as *P. brassicae*, *V. atalanta* and *A. gamma*, which presumably breed there every year and may proceed to more northerly regions. The period studied was predominantly unfavourable for migrations.

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- Worms, C. G. M. de. 1973. Ditto. 1972. *Ibid.* **16** (3): 173-176.
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- Worms, C. G. M. de. 1975. Ditto. 1974. *Ibid.* **17** (1): 60-64.
- Zucchi, H. 1975. Gemeinsame wanderung von *Pieris brassicae* L., *Gonepteryx rhamni* L. un *Vanessa atalanta* L. *Atalanta*, **6** (1): 9.

Current Literature

Natural History Auctions 1700-1972: A Register of Sales in The British Isles. Compiled and with an Introduction by **J. M. Chalmers-Hunt**. Contributory Articles by **S. Peter Dance, Peter G. Embrey, W. D. Ian Rolfe, Clive Simson, William T. Stearn** and **Alwyne Wheeler**. xii+189 pp. f'cap. Sotheby Parke Bernet Publications Limited, 36 Dover Street, London W1X 3RB. 1976. Price £12.50 (plus 75p postage and packing).

At first one would wonder whether this subject could be of interest wide enough to justify so much exacting hard work, but it at once becomes clear from the author's introduction that the book affords a very useful tool for those naturalists interested in locating the material dealt with by authors of a bygone age.

There are seven contributory articles outlining the various divisions applicable to Natural History Sales: the first, by the author, is headed Entomological Sales, conducted since 1663. This gives many interesting instances of particular sales of important material, and the picture of such sales as it changes through the years. The second is headed Zoological Specimens other than Insects, Mollusca and Birds, by Alwyne Wheeler, who points out that owing to the greater difficulties incurred in preserving and storing such material, such sales were less frequent than insect sales. The chapter quotes several sales with indications of the destination of much material.

The third division, by William T. Stearn, is headed Botanical Auction Sales. The author gives an interesting account of the development of the study, resulting in the birth of historic herbaria, and it would seem that the greater part of this valuable material was passed on by gift or bequest rather than by sale, so that most of it went to The British Museum (Natural History), Kew, or to the major universities.

The fourth division, Ornithology, by Clive Simson, gives a history of the collection of bird skins, stuffed specimens and eggs. Much space is taken up with accounts of the known examples of Great Auk eggs, and the author points out that